NEW SPECIES OF THE BRYOZOAN GENERA *BATOPORA* AND *LACRIMULA* (BATOPORIDAE) FROM AUSTRALIA

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Examination of samples of bryozoans from the south- eastern slope sediments of Australia ("Franklin" SLOPE Stations 6, 7), has revealed the presence of many specimens of several genera with species which have minute, rooted colony forms. Among these are new species of the genera *Batopora* Reuss (*B. problematica*) and *Lacrimula* Cook (*L. affinis*). The structure of colonies is briefly described. The family Batoporidae is considered to contain only these two genera, although they have relationships with the discoidal genus *Orbitulipora*, and similarities in colony form to the genera assigned to the Conescharellinidae.

Keywords: Bryozoa, Cheilostomata, Batopoidae, *Lacrimula*, *Batopora*, Australia, new taxa

THE STRUCTURE and affinities of both *Batopora* and *Lacrimula* were described by Cook & Lagaaij (1976) in some detail. Copiously illustrated notes on the astogeny of *Batopora* have recently been provided by Pizzaferri & Braga (2000). Both genera include small, conical or globular (conescharelliniform) colonies, which are known from Recent examples, to be anchored by rootlets. Colonies are formed entirely by "reversed frontal budding", and in this respect are similar to species of both Conescharellinidae and the genus *Sphaeropora* (Lepraliellidae). However, the Batoporidae does not appear to be closely related to either of these groups.

Material and methods. All specimens are part of the collections of the Museum of Victoria (NMV), and were collected by the RV "Franklin" from two Stations: Stn 6 off Nowra NSW 34°51.90'S 151°12.60'E 770 m, 15.7.86, bottom, crinoid dominated, and Stn 7 off Nowra NSW 34°52.29'S 151° 15.02'E 1096 m, 15.7.86, epibenthic sled. All the colonies of *Batopora* and *Lacrimula* were accompanied by two species of *Trochosodon* and four species of *Conescharellina*.

Measurements. Lor, lor, length and width of orifice; Lov, lov, length and width of ovicell; Lav, lav, length and width of avicularian rostrum.

BATOPORIDAE Neviani, 1901

Batoporideae Neviani 1901: 220 (106).
Orbituliporidae Canu & Bassler 1923 part; Cook & Lagaaij 1976 part.
Batoporidae (presumably for Batoporideae) Gordon & d'Hondt 1997: 70.

Type genus. Batopora Reuss (1867)

Remarks. Batoporidae includes only *Batopora* and *Lacrimula*. Gordon & d'Hondt (1997) emended Neviani's name, and regarded it as a senior synonym of "Orbituliporidae" in general, but did not discuss which genera had been assigned to either family. Neviani (1901) included *Batopora* with *Conescharellina*, which last is referable to the family Conescharellinidae. Canu & Bassler (1923) included a wide range of genera, the majority of which has been assigned subsequently to other families.

Batopora and *Lacrimula* include a range of very similar forms. At present, the distinction between genera relies upon the differences in shape of primary orifice, in the origin of rootlets, and in the relationships of the ovicell. Orbituliporidae is maintained here for the discoidal genus *Orbitulipora*.

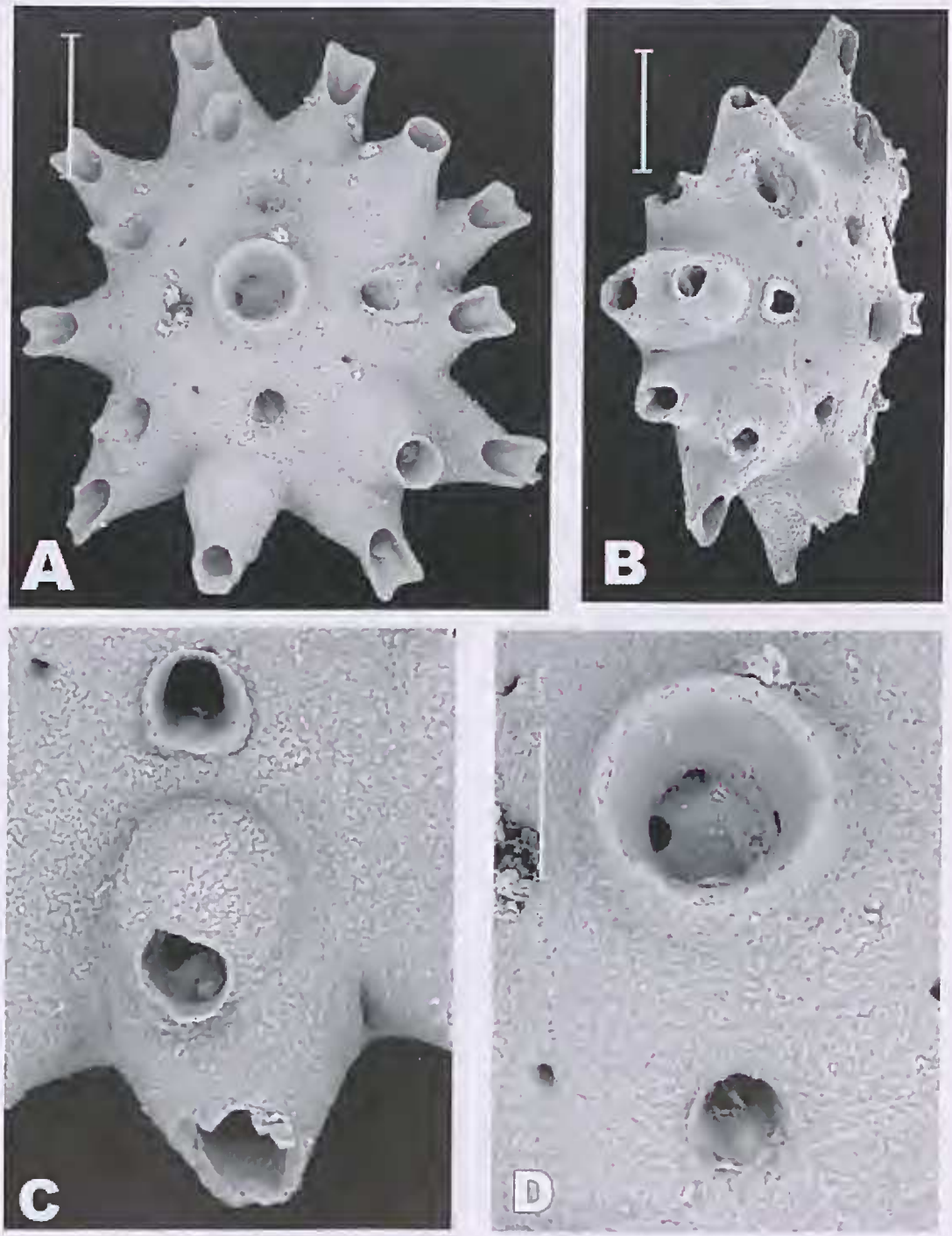

Fig. 1. A-D, *Batopora problematica* sp. nov. A, D. Holotype, NMV F98031, A. Colony, adapical view showing central kenozooid and two ovicells, x42. D. Central kenozooid showing cribrate plate, x110. B, C. Paratype, NMV F98032. B. Lateral view of colony with ovicells, x36. C. Detail of primary orifice and ovicell, x108.

Batopora Reuss 1867

Type species. B. stoliczkai Reuss 1867: 223, pl. 2, figs 2-4.

Description. Colonies usually small (up to 3 mm diameter in one species), globular or conical (coneseharelliniform), all zooids originating from reversed frontal buds. Zooid orifices not sinuate, with a slightly curved antapical edge. Ovicells prominent, peristomial, not closed by the operculum. Avicularia small, interzoooidal, with paired condyles, or absent. Rootlets arising from an adapical pit, surrounded by kenozooids, or from a single, central, prominent adapical kenozooid. Recent species are from deep, or very deep water.

Remarks. The type species, from the Lower Oligocene of Germany, has very small globular colonies with minute interzooidal kenozooids. A better understanding of the characters of the species *B. stoliczkai*, and its relationship with *B. multiradiata* Reuss 1869, requires revision of the European material. The genus has a long fossil record extending from the Lower Eocene of Europe (Cook & Lagaaij 1976).

Gordon & d'Hondt (1997) have suggested that *Batopora* sensu lato almost certainly includes a diversity of species which may not be strictly congeneric. It is also obvious that the increasing diversity of known forms of *Lacrimula* Cook makes separation of the genera somewhat arbitrary, and we agree that both *Batopora* and *Lacrimula* require revision. Gordon & d'Hondt (1997) introduced a new genus group, *Ptoboroa*, for a previously named species, *Batopora pulchrior* Gordon (1989), from New Zealand, and added a new form, *P. gelasinus*, from New Caledonia. Both these species were illustrated with distinct adapical pores on the edge of the peristome. These pores are known to be the origin of ovicells in Coneseharellinidae, the development of which was illustrated in *Conescharellina* by Gordon (1985, fig. 23) and in *P. pulchrior* by Gordon (1989, pl. 48A). The ovicells of *P. pulchrior* have an ectooecium and wide entooecial frontal area, and resemble those known in species of Coneseharellinidae. The ovicells of *Batopora* and *Lacrimula* are peristomial and hyperstomial respectively, do not have an exposed entooecial area, and do not develop from an adapical pore. It appears therefore, that in spite of its central, cribrate rootlet kenozooid, which is almost exactly like that of *B. problematica*, *Ptoboroa pulchrior* is not a member of the Batoporidae, but is referable to a distinct genus of Coneseharellinidae.

Batopora problematica sp. nov.
(Figs 1A-D, 2A)

Holotype. NMV F98031, figured specimen SLOPE Stn 7.

Paratype. NMV F98032, figured specimen. SLOPE Stn 7.

Other material. SLOPE Stn 7, 10 colonies, 9 with ovicells, 1 with rootlet. SLOPE Stn 6, 5 colonies, 4 with ovicells, 1 with rootlet.

Etymology. problema (Gr.), a puzzle, referring to the complex of morphological characters present.

Description. Colonies small, stellate, fairly flat, with an adapical central kenozooidal rootlet tube, which has a central cribrate plate. Zooids in whorls of 4-5; frontal calcification finely granular, mainly imperforate with rare marginal frontal septular pores. The zooids have elongated peristomes, which are extended antapically, concealing a primary orifice which is curved on the antapical side in an adapical direction. Ovicells, large, prominent, peristomial, not closed by the operculum, frontal calcification similar to zooids. Avicularia absent.

Remarks. B. problematica has far smaller colonies than *B. murrayi* Cook (1966) from the western Indian Ocean, but resembles *B. lagaaiji* and *B. uola* from eastern South Africa, described by Hayward & Cook (1979), and discussed by Cook (1981). These latter species have colonies that are similar in size to *B. problematica*, but are proportionally higher, with a smaller central, rootlet kenozooid. An unnamed species from a New Caledonian locality (without data), was figured by d'Hondt (1986, pl. 8, fig. 2), and appears to resemble *B. problematica*. Gordon (1989: 81) suggested that it might be placed in the same genus as *B. pulchrior*.

The strikingly similar appearance of *Batopora problematica* and the type species of *Ptoboroa* Gordon & d'Hondt (1997), *Batopora pulchrior* Gordon (1989), emphasizes the complexities of morphological characters and character states found among species and putative generic groups with coneseharelliniform colonies. To a certain extent, this is a result of the constraints of minute size, reversed

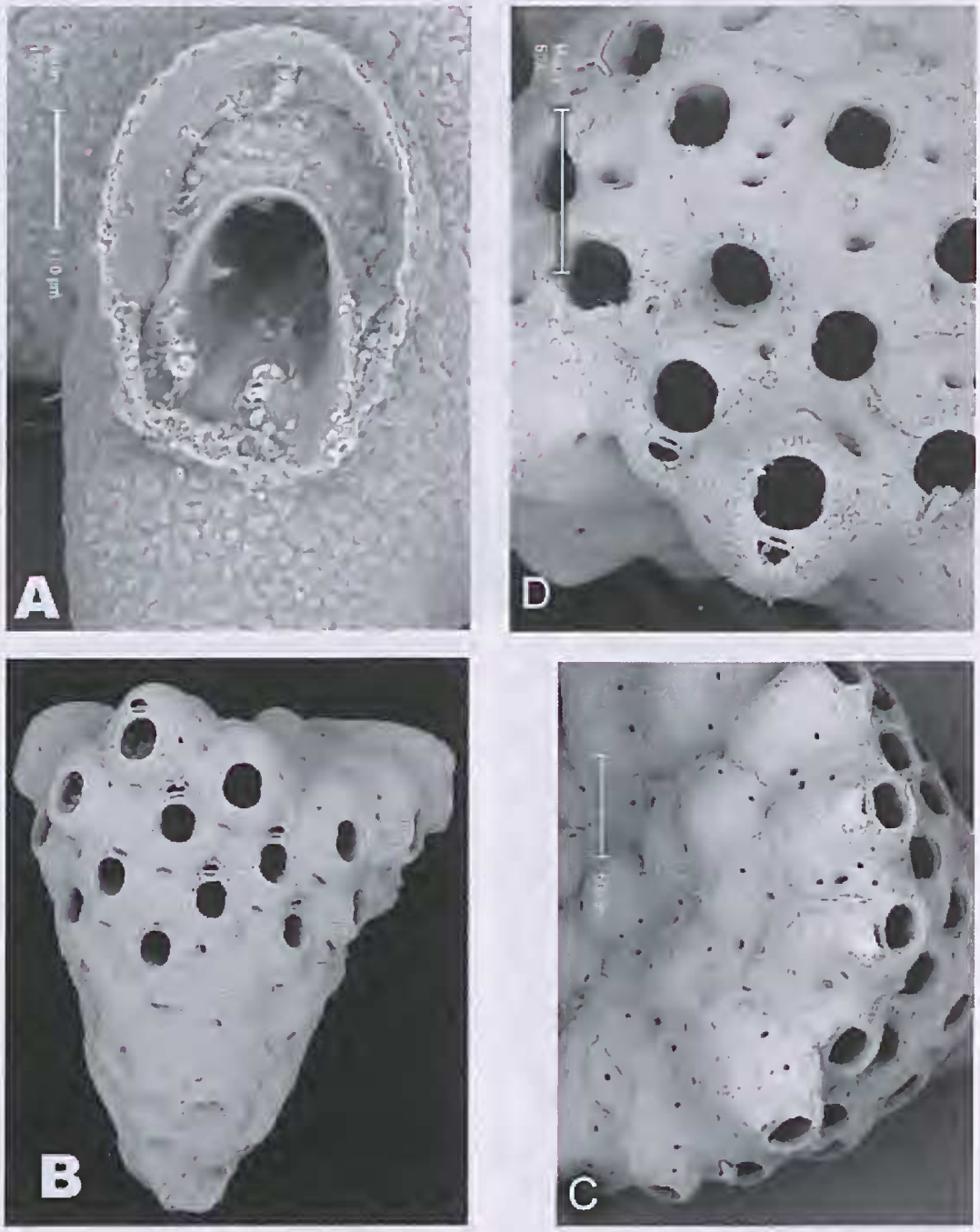

Fig. 2. A, *Batopora problematica* sp. nov. Paratype NMV F98032. Detail of broken ovicell showing relationship between peristome and ovicell, x170. B-D, *Lacrimula affinis* sp. nov. B. Holotype NMV F98033. Colony showing adapical kenozooids, x26. C. Paratype F98034, Antapical surface of colony showing frontal septular pores, x30. D. Paratype F98034, Orifices with avicularia, x47.

frontal budding, and a mode of life involving anchorage by rootlets into fine-grained substrata.

Measurements. Av. colony diameter 2.3 mm; height 1.1 mm; diameter of central kenozooid 0.30 mm; Lov 0.23 mm; lov 0.30 mm; Lor 0.11-0.12mm; lor 0.11-0.12 mm.

Lacrimula Cook 1966

Lacrimula Cook 1966: 217.

Type species. Lacrimula burrowsi Cook 1966: 218, pl. 2, figs 2, 3, 4, text-fig. 4A.

Description. Colonies stellate, conical or bell-shaped. Zooids alternating in whorls; zooid orifices large, with small paired condyles. Avicularia interzooidal or oral, small, with condyles or a bar. Adapical kenozooidal rootlet complex often associated with avicularia. Ovicells large, hyperstomial, closed by the operculum.

Remarks. Like *Batopora*, *Lacrimula* has a long fossil record, extending from the Eocene of Europe and also occurs in the Miocene of Indonesia (Cook & Lagaaij 1976). Recent species from the Indian Ocean tend to be from slightly shallower depths than those of *Batopora*, but the large numbers of colonies from over 1000 m off Australia suggest that species of both genera probably share a similar range.

Lacrimula affinis sp. nov.
(Fig 2B-D)

Holotype. NMV F98033, figured specimen SLOPE Stn 7.

Paratype. NMV F98034, figured specimen SLOPE Stn 7.

Other material. SLOPE Stn 7, 50 colonies, 8 with rootlets SLOPE Stn 6, 7 colonies, 1 with rootlet.

Etymology. affinis (L) - like, referring to the similarities with *L. burrowsi*.

Description. Large, conical *Lacrimula* colonies, with a heavily calcified adapical area formed by kenozooids. Zooids in whorls of 5-6, bulbous; primary orifices large, rounded, with small paired condyles; peristome absent. Zooid calcification coarsely granular, mainly imperforate except for few marginal septular pores. Avicularia small, rare, on the antapical side of the orifice, with a rounded rostrum and mandible slung on complete bar. Ovicells not found.

Remarks. L. affinis is very similar in appearance to *L. burrowsi* from the western Indian Ocean (Cook 1966). The colonies are of a comparable size, but the orifices of *L. affinis* are significantly larger than those of *L. burrowsi*. Colonies differ principally in the form and distribution of the avicularia and the small size of the orifice articular condyles. *L. burrowsi* frequently has large avicularia near the adapical region, but all the colonies of *L. affinis* have a massive development of secondary calcification in this region, and avicularia cannot be seen. The avicularia of *L. burrowsi* are interzooidal and have mandibles slung on elongated paired condyles; those of *L. affinis* are oral and antapical, and have a delicate complete bar. Ovicells in *L. burrowsi* and *L. pyriformis* Cook are known to be large, hyperstomial and closed by the operculum.

Measurements. Average colony diameter 2.5 mm; height 3.3 mm; Lor 0.23 mm; lor 0.22 mm; Lav and lav, 0.11 mm.

DISCUSSION

These records are the first for the family Batoporidae from the Australian region. The occurrence of *B. problematica* and *L. affinis* from deep water off eastern Australia extends the known distribution of both genera to the Tasman Sea, although species are known from Fiji and New Caledonia. An unnamed species of *Lacrimula* from deep water (677 m.) in the China Sea was illustrated by Cook (1981, Pl.C, fig. 3), but *Lacrimula sinensis* Lu (1991: 73, Pl. 20, fig.3), from the South China Sea, appears to belong to the genus *Characodoma*, as do also the specimens of *Osthimosia* species he figured. Colonies of *Characodoma* are frequently small, rooted, and associated with conescharellinid and batoporid species under "sand-fauna" conditions (Cadée 1987, Cook & Bock 1996, and Rosso 1999). The large number of colonies of Batoporidae in the Australian samples described here is the direct result of the method of collection by epibenthic sled. Both *B. problematica* and *L. affinis* were found from greater depths than other species, although the range of *B. murrayi* overlaps that of *B.*

problematica.

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